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File Code: 3420 **Date:** October 20, 2004
Route To:

Subject: Spruce Beetle at Snowbowl Ski Area (peaksrd)

To: District Ranger, Peaks RD, Coconino NF

We (Arizona Zone of Forest Health Protection) have been working with your staff silviculturist, Jim Rolf, regarding spruce beetle, *Dendroctonus rufipennis*, activity and suppression treatments at the Snowbowl Ski Area over the last four years. This letter summarizes the results of suppression treatments and observations regarding spruce beetle activity in this area. We provide a background of spruce beetle activity, a description of past and present suppression actions, and a discussion of possible future actions. In addition, the results of our monitoring spruce beetle flight activity using bait funnel traps is presented.

Background

In the fall of 1999, a windstorm caused damage to spruce-fir stands on the San Francisco Peaks. The majority of this damage was in the form of causing spruce trees to blow over and was primarily spread across 25 acres within the Snowbowl Ski permit area. Spruce beetle is well known to infest trees that have been blown over. Surveys in 2000 and 2001 indicated spruce beetle activity had occurred in essentially all the wind-thrown spruce.

A survey in the fall of 2001 found several standing infested spruce. A total of 161 infested spruce trees were tallied within the blowdown area adjacent to the chairlift below Midway. These findings indicated that some of the brood developed and emerged within a one-year time span. At this time, most of the infested trees were limited to within the areas of blowdown; that is, beetles had not yet expanded to adjacent stands.

Based on walk-through surveys, stands adjacent to blowdown area seemed to be at moderate-high to high risk. There are numerous spruce trees greater than 16 inches diameter at breast height, and spruce composition and basal areas are high. This combination of stand characteristics and increasing beetle populations indicated that an outbreak was likely.

Past suppression efforts and current situation

In 2001, the Peaks RD contracted with the Coconino Rural Environment Corps (CREC) [formerly called Northern Arizona Conservation Corps (NACC)] to begin treating infested blowdown by limbing, bucking, and scorching the outer bark with torches. Due to the narrow window of favorable weather to complete this treatment, only a small percentage of the blowdown was treated.

More than 700 infested spruce trees and new areas of blowdown were identified in late summer of 2002. In addition to surveying within the permit area, we ran a two-chain wide survey in the Kachina Wilderness adjacent to the Upper Ridge ski run (W1 in ***Figure 1***). Only 8 infested

spruce trees were found in approximately 8 acres surveyed, indicating that most of the infestation was limited to the permit area. In 2002, the District contracted CREC to treat standing infested trees by felling and peeling through the use of a "log wizard." Removing the bark results in the developing brood to desiccate and die. The use of a log wizard permits a wider window of opportunity for treatment compared with burning. However, because the District did not receive funds until mid-April, chainsaw restrictions and then forest closures, this treatment did not begin until August and only approximately 150 trees were felled and peeled. Forested areas C, E, F, and G were partially or completely treated.

In 2003, the Peaks RD also contracted CREC to treat standing infested trees by felling and peeling through the use of a "log wizard". From July through September, approximately 330 trees were felled and peeled. Forested areas A, C, and F were partially or completely treated. Funding delays and chainsaw restrictions due to fire risk prevented the felling and peeling treatments from starting until late July, and weather delays prevented the completion of treatments. In addition, infested trees adjacent to the Agassiz Chair Lift were not felled and peeled because of their potential hazard to the lift. Thus, some spruce beetle emerged from previously infested trees before treatments took place, and not all infested trees were treated. In August 2003, personnel from our office identified 289 newly infested spruce trees within forest areas A, C, and F. Limited resources and time prevented other areas from being surveyed at that time. During a recent visit to Snowbowl, I observed additional recent attacks in areas G and I. In addition to the felling and peeling treatment, the anti-aggregation pheromone for spruce beetle, MCH, was deployed on approximately 50 acres of forested area within forested areas A, B, C, H, and W1 during the summer of 2003. The use of these pheromone treatments reduced new attacks within area A by nearly 75 percent. In other areas treated with MCH, there were similar reductions in the number of newly infested trees.

In 2004, the Peaks RD again contracted CREC to create trap trees, to treat standing infested trees by felling and peeling, and to deploy MCH bubble capsules (***Figure 2***). Because infested trees near the chairlift were not felled and because several factors have prevented infested trees from being treated prior to beetle emergence in past years, this additional treatment of using trap trees was implemented. Trap trees are uninfested trees with a dbh greater than 12 inches that are felled before beetle flight initiates in the early summer (Holsten *et al*., 1999). Trap trees can absorb up to 10 times the number of spruce beetles that a standing tree will absorb and can help to suppress increasing spruce beetle populations (Bentz and Munson, 2000). In May 2004, 12 clusters of five trap trees (60 trap trees in total) were created by selecting uninfested spruce trees within in designated areas (***Figure 3***). Inspection of trap trees and stumps during the summer of 2004 indicated that they had become infested with both spruce beetle and spruce ips (*Ips pilifrons*). All 60 trap trees and stumps were peeled in September of 2004.

From September through mid-October, approximately 87 current infested trees were felled and peeled in forested areas A (only 5 of 18 trees treated), C, F, G and I (***Table 1***), and an additional 18 trees were felled and peeled along the Agassiz Chair Lift with the assistance of Arizona Snowbowl staff. Most of these standing infested trees were concentrated around the clusters of trap trees; a circumstance known as "spill over". MCH was deployed on approximately 50 acres of forested area within forested areas A, B, C, H, and W1 during May of 2004. The combination of treatments reduced new attacks within forested areas by approximately 75 percent and the spruce beetle population as a whole appears to be diminished within the Arizona Snowbowl permit area.

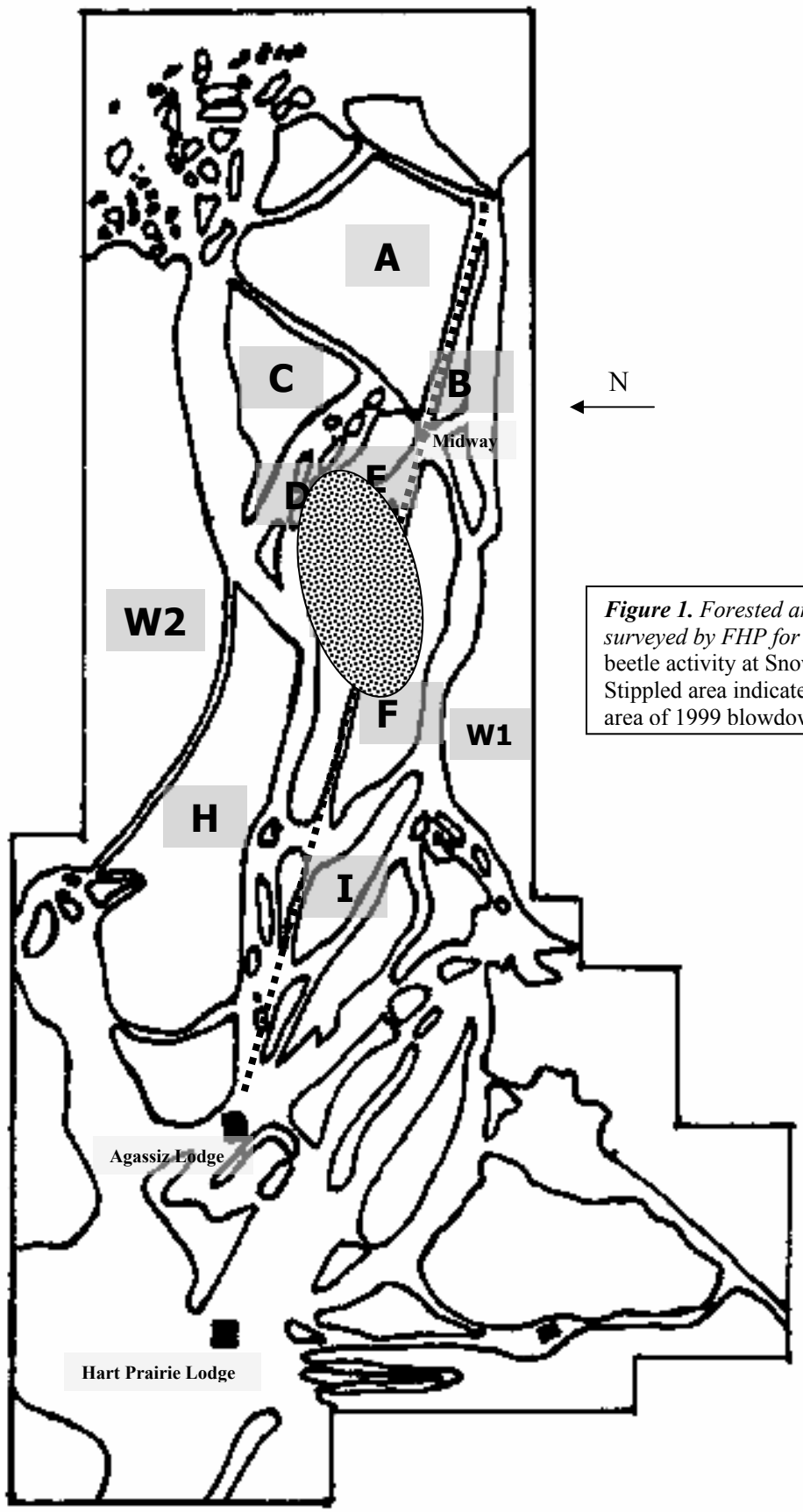

Figure 1. *Forested areas surveyed by FHP for spruce* beetle activity at Snowbowl. Stippled area indicates primary area of 1999 blowdown event.

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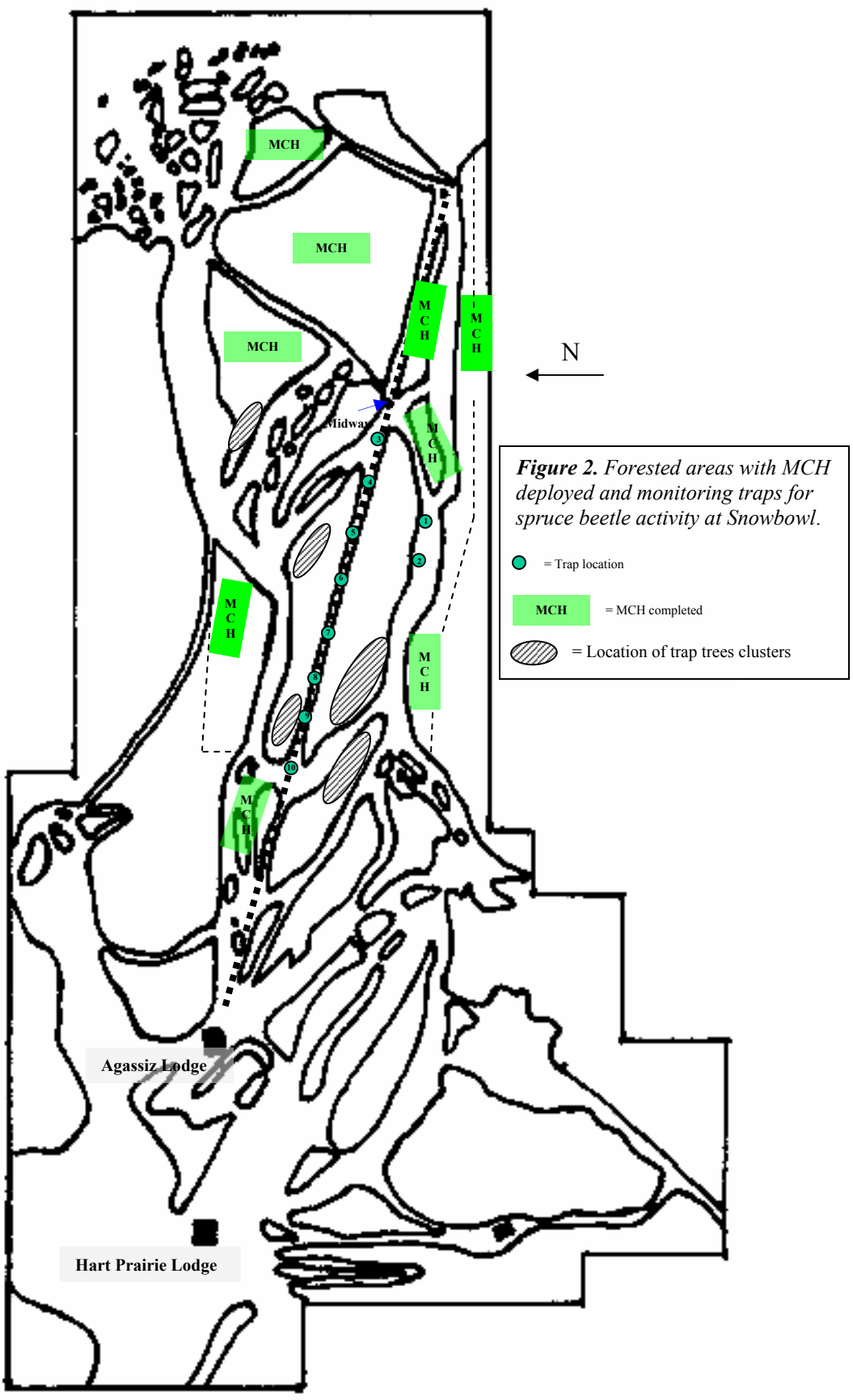

Figure 2. *Forested areas with MCH deployed and monitoring traps for spruce beetle activity at Snowbowl.*

Table 1. *Number of spruce beetle-infested trees and average diameter at breast height (DBH) within forested islands at Snowbowl Ski area identified in August 2003. See Figure 1 for location of survey areas. Areas not surveyed or without any infested trees are omitted from table.*

	Survey Area					
	A	**C**	**F**	**G**	**I**	**TOTAL**
Average DBH	15.5	21.0	15.2	14.9	10.3	15.3
Number of trees	18	13	45	13	11	100

Figure 3. *Use of trap trees for suppressing spruce beetle populations at Arizona Snowbowl. Trap tree after initial felling in May 2004 (top left), infested trap tree in June 2004 (top right), peeling trap tree in September 2004 (bottom left) and peeling infested stump in September 2004 (bottom right).*

Spruce beetle flight periodicity at Arizona Snowbowl

Because no data existed for spruce beetle flight periods in Arizona, we began to monitor beetle flight periodicity in 2002. Bark beetle flight periodicity is typically measured using Lindgren® funnel traps bait with beetle specific lures (Lindgren, 1983). Therefore, 12-unit Lindgren® multiple-funnel traps were deployed below the Agassiz Chair Lift between forested areas F and G. Traps were bait with either a 2 component or 3 component lure in 2002 and 3 component lures in 2003 and 2004. Beetles were collected from traps either weekly or every other week and numbers of spruce beetle and spruce ips counted. Based on three years of trapping, the peak of spruce beetle flight seems to occur in early July and the spruce ips peak occurs in late May or early June (***Figure 4***). In addition, the 3 component lure caught significantly more beetles than the 2 component lure. Implications of these findings include that because spruce ips flies earlier in the year than spruce beetle, ips have the ability to colonize down material before spruce beetle. Second, surveys for current infested spruce trees are best achieved in early September after beetle have completed their flight. Third, the 3 component lure should be used in a trap out approach for suppressing spruce beetle populations.

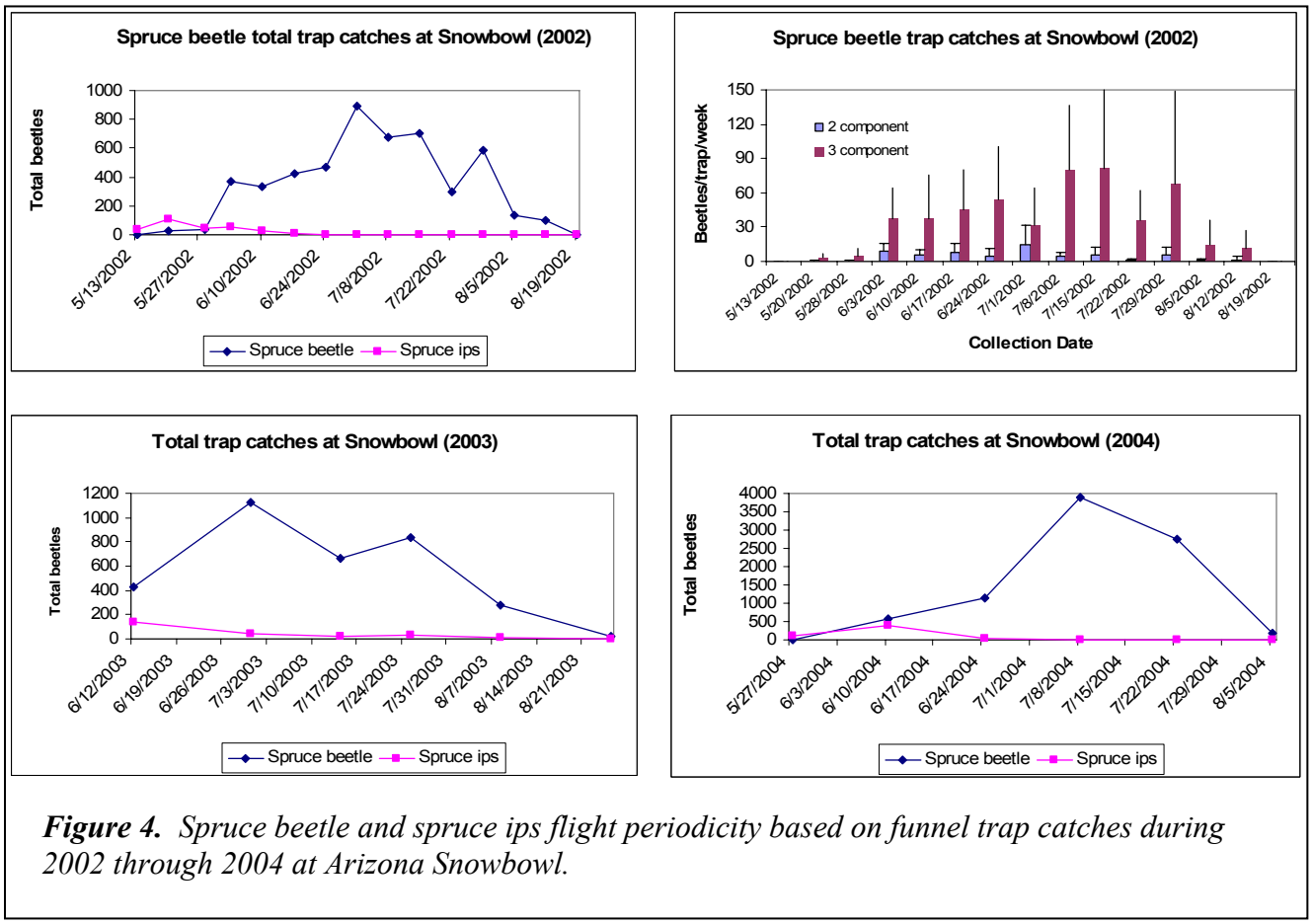

Figure 4. *Spruce beetle and spruce ips flight periodicity based on funnel trap catches during 2002 through 2004 at Arizona Snowbowl.*

Future situation

Based on the reduced numbers of standing infested trees in areas surveyed, it appears that treatments have continued to contain most of the spruce beetle infestation. I feel that the use of trap trees in combination with MCH and peeling standing infested trees has significantly impacted the spruce beetle population and limited new mortality to primarily occurring within areas of the original blowdown (i.e., forested area F). These integrated treatments should be continued in 2005, as spruce beetle suppression and prevention treatments generally take several years to complete (Bentz and Munson, 2000). I recommend that trap trees be used again in 2005; however, because of the lower spruce beetle population, the number could probably be reduced to 30 or fewer trees. Additional surveys, and possibly treatments, will likely be necessary beyond 2005 to determine the level of spruce beetle populations.

Other observations made during 2004 include, first, when selecting trees for the trap tree approach, trees should be located in heavily shaded areas and exposed boles could be covered with branches to prevent drying out of the cambium and to minimize the level of spruce ips infestation along the bole. Using this method should allow the boles to accommodate higher numbers of spruce beetle. Because spruce ips peak flight occurs approximately one month before spruce beetle peak flight, felling trees in mid June may increase spruce beetles and decrease spruce ips in the trap trees due to less competition for brood material. However, fire danger restrictions often occur during this time of the year and therefore may prohibit felling of trees at this time.

Second, a crew of two to three people surveying ahead of the fellers and peelers enhanced the efficiency of felling and peeling treatments. This type of teamwork should continue in 2005 and can be facilitated by the training of one to three people on the CREC crew that would be dedicated to surveying will greatly facilitate this work. Our office can provide this training.

Third, the work schedule that was developed last year to improve the success of completing suppression activities was beneficial from the stand point that there where few interruptions caused by weather, fire danger restrictions, or funding constraints. I recommend the same schedule be used in 2005:

1. Felling and peeling treatments should take place in September through October. The reasoning for this is that over the last three years, both fire danger restrictions (typically early June through early July) and weather delays (mid July through early September) have hampered treatments from efficiently being implemented.

2. Trap trees should be felled in mid to late May or early June prior to spruce beetle flight. Trap trees should be peeled using log wizards after beetle flight is completed (early September). Monitoring of beetle flight will be completed using baited Lindgren funnel traps. Monitoring traps should be in place by mid-May until early September.

3. MCH should be deployed in a grid fashion through areas identified in ***Figure 2*** before the first of June. The CREC crew will assist in the stapling of MCH bubble capsules, as they have two State of Arizona certified pest applicators and have experience using MCH. Our office will supervise handling and deployment of MCH. MCH should be ordered by March and received by the end of April.

Funds may be available for FY2005 from Forest Health Protection for suppressing spruce beetle populations at the Snowbowl Ski area. Requests for these funds should be in no later than October 15, 2004.

If you have any questions regarding my assessment of current bark beetle activities within the project area, its potential effect on residual standing trees, or my recommendations, please let me know. I can be reached at (928) 556-2074.

/s/ Joel D. Mcmillin
JOEL D. McMILLIN
Entomologist, Forest Health, Arizona Zone

cc: Mailroom R3 Coconino, James Rolf, Michael Manthei, John Anhold, Debra Allen-Reid, Leonard Lucero, Gene Waldrip

References Cited

Bentz, B.J. and A.S. Munson. 2000. Spruce beetle population suppression in Northern Utah. Western Journal of Applied Forestry. 15: 122-128.

Holsten, E.H., R.W. Their and K.E. Gibson. 1999. The spruce beetle. USDA Forest Service Forest Insect and Disease Leaflet 127. 12 p.

Lindgren, B. S. 1983. A multiple funnel trap for scolytid beetles (Coleoptera). Canadian Entomologist 115: 299-302.